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Description of the female and male of *Simulium* (*Montisimulium*) *angkaense* (Diptera: Simuliidae) from Thailand

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Abstract: The female and male of *Simulium* (*Montisimulium*) *angkaense* are described for the first time, based on adult specimens reared from pupae and/or larvae collected from the Siribhume waterfall (type locality), Chiang Mai, Thailand. The female and male of this species are compared with those of *S.* (*M.*) *merga* and the female of *S.* (*M.*) *surachaii*, both of which were recorded from Thailand.

Key words: black fly, Simuliidae, *Simulium*, Thailand, *Montisimulium*

In Thailand, *Simulium* (*Montisimulium*) Rubtsov, a small subgenus in the Oriental and Palaearctic Regions, was first reported as an unnamed species, *S.* (*M.*) sp. G, on the basis of larvae collected at Ang Ka (1,460 m in altitude) in Doi Inthanon National Park, Chiang Mai, when its salivary gland polytene chromosomes were shown (Kuvangkadilok et al., 1998). Later, Takaoka and Choochote (2005a) described a new species, *S.* (*M.*) *merga* (probably the same as *S.* (*M.*) sp. G), from adult, pupal and larval specimens collected at Ang Ka, together with *S.* (*M.*) *surachaii* from a single female caught by a hand-net at the same locality. Two more new species of this subgenus, which were found in Doi Inthanon National Park, were described as *S.* (*M.*) *angkaense* and *S.* (*M.*) *laoleense*, based on pupal and/or larval specimens (Takaoka and Choochote, 2005b).

In this paper, we describe the female and male of *S.* (*M.*) *angkaense* for the first time, on the basis of adult specimens reared from pupae and/or mature larvae collected from the Siribhume waterfall (type locality) in Doi Inthanon National Park, Chiang Mai. The pupae and larvae of this species were readily identified by the characteristics noted by Takaoka and Choochote (2005b).

The terms for morphological features used here follow those of Takaoka (2003). The adult specimens of this species are deposited at the Department of Infectious Disease Control, Oita University.

Simulium (*Montisimulium*) *angkaense* Takaoka and Choochote, 2005

Simulium (*Montisimulium*) *angkaense* Takaoka and Choochote, 2005: 209–212 (pupa and mature larva).

DESCRIPTION. **Female**. Body length 3.2–3.3 mm. ***Head***. Slightly narrower than thorax. Frons blackish-brown, thinly whitish-gray pruinose, slightly shiny when illuminated at certain angle of light, densely covered with whitish-yellow recumbent hairs interspersed with several dark longer and stouter hairs along each lateral margin. Frontal ratio 1.5–1.6 : 1.0 : 1.9–2.0. Frons-head ratio 1.0 : 4.4–5.0. Fronto-ocular area well developed, triangular, directed laterally and somewhat upwardly.

Clypeus blackish-brown, thinly whitish-gray pruinose, slightly shiny when illuminated at certain angle of light, densely covered with whitish-yellow recumbent hairs (except narrow portion near upper margin bare) intermixed with several dark longer and stouter hairs along lateral margins and near lower margin. Labrum 0.94 times as long as clypeus. Antenna composed of scape, pedicel and 9 flagellomeres, blackish-brown except scape, pedicel, and base of 1st flagellomere yellow; 1st flagellomere 1.8 times as long as 2nd one. Maxillary palp consisting of 5 segments, dark yellow on 1st and 2nd segments, blackish-brown on segment 3, and dark gray on 4th and 5th segments, proportional lengths of 3rd, 4th, and 5th segments 1.0 : 1.0 : 1.7; 3rd segment (Fig. 1A) much enlarged; sensory vesicle (Fig. 1 A) elongate, 2.78 times as long as wide, 0.52–0.54 times as long as 3rd segment, and with opening of moderate size medially or a little apically. Lacinia with 6 or 7 inner and 8–10 outer teeth. Mandible with 18 or 19 inner teeth and lacking outer ones. Cibarium smooth on posterior margin, with well-sclerotized arms directed anterolaterally. ***Thorax***. Scutum nearly blackish-brown except anterolateral calli ocherous, slightly shiny when illuminated at certain angle of light, and densely covered with whitish-yellow recumbent hairs mixed with several dark brown upright long hairs on prescutellar area. Scutellum light to medium brown, with many dark upright long hairs as well as whitish-yellow shorter hairs. Postnotum dark brown, slightly shiny when illuminated at certain angle of light, bare. Pleural membrane bare. Katepisternum longer than deep, dark brown, whitish pruinose, shiny when illuminated at certain angle of light and bare. ***Legs***. Foreleg: coxa medium to dark yellow; trochanter dark yellow to light brown with lower surface medium brown; femur dark yellow to light brown with apical cap medium brown, though inner surface dark yellow; tibia medium brown with median portion largely light brown on outer and anterior surface; tarsus brownish-black; basitarsus very slightly dilated, 8.2 times as long as its greatest width. Midleg: coxa medium brown with posterior surface blackish-brown; trochanter yellow; femur yellow with apical cap medium brown; tibia medium brown with median portion largely light brown on anterior and outer surface; tarsus blackish-brown. Hind leg: coxa medium brown; trochanter yellow; femur yellow to ocherous with apical cap medium brown; tibia medium brown with median portion largely light brown on outer and inner surface and base ocherous; tarsus medium to dark brown except basal 1/2 of 2nd tarsal segment ocherous; basitarsus (Fig. 1B) nearly parallel-sided on basal 1/2 or little more, then somewhat narrowed toward apex, 7.3 times as long as its greatest width, 0.68 and 0.54 times as wide as greatest widths of tibia and femur, respectively; calcipala well developed, nearly as long as wide, and half as wide as the greatest portion of basitarsus; pedisulcus well developed. All claws (Fig. 1C) each with medium-sized basal tooth 0.32 times as long as claw. ***Wing***. Length 2.5 mm. Costa with 2 parallel rows of dark short spines as well as dark hairs except basal patch of hairs whitish-yellow. Subcosta with dark hairs except near apex bare. Hair tuft on stem vein dark brown. Basal portion of radius fully haired. R_1 with dark spinules and hairs. R_2 with dark hairs only. Basal cell absent. ***Abdomen***. Basal scale light brown, with fringe of whitish-yellow long hairs. Dorsal surface of abdomen medium to dark brown except that of segment 2 ocherous (though tergite medium brown), moderately covered with whitish-yellow short hairs interspersed with dark ones; tergites 2, 6–8 shiny when illuminated at certain angle of light; ventral surface of abdomen nearly light ocherous except segment 8 darkened; segment 7 with shiny large medium brown sternal plate medially. ***Genitalia***. Sternite 8 (Fig. 1D) wide, bare medially but furnished with 42–44 short to long hairs on each side. Ovipositor valves (Fig. 1D) tongue-like, produced posteromedially, thin, membranous (except inner margin narrowly sclerotized), densely covered with microsetae (except narrow portion along posterior margin bare) interspersed with 3 or 4 short hairs; inner margins widely separated basally from each other, approaching closely to each other along apical 2/3; inner margin with wide bare lobe (somewhat sclerotized near base) protruding dorsally along posterior 2/3. Genital fork (Fig. 1E) inverted-Y shaped, with well sclerotized stem and wide arms (ratio of greatest width at base of arm against narrowest width beyond middle 1.33); stem somewhat curved dorsally; each arm produced posteromedially in form of wide triangular plate, and with distinct projection directed

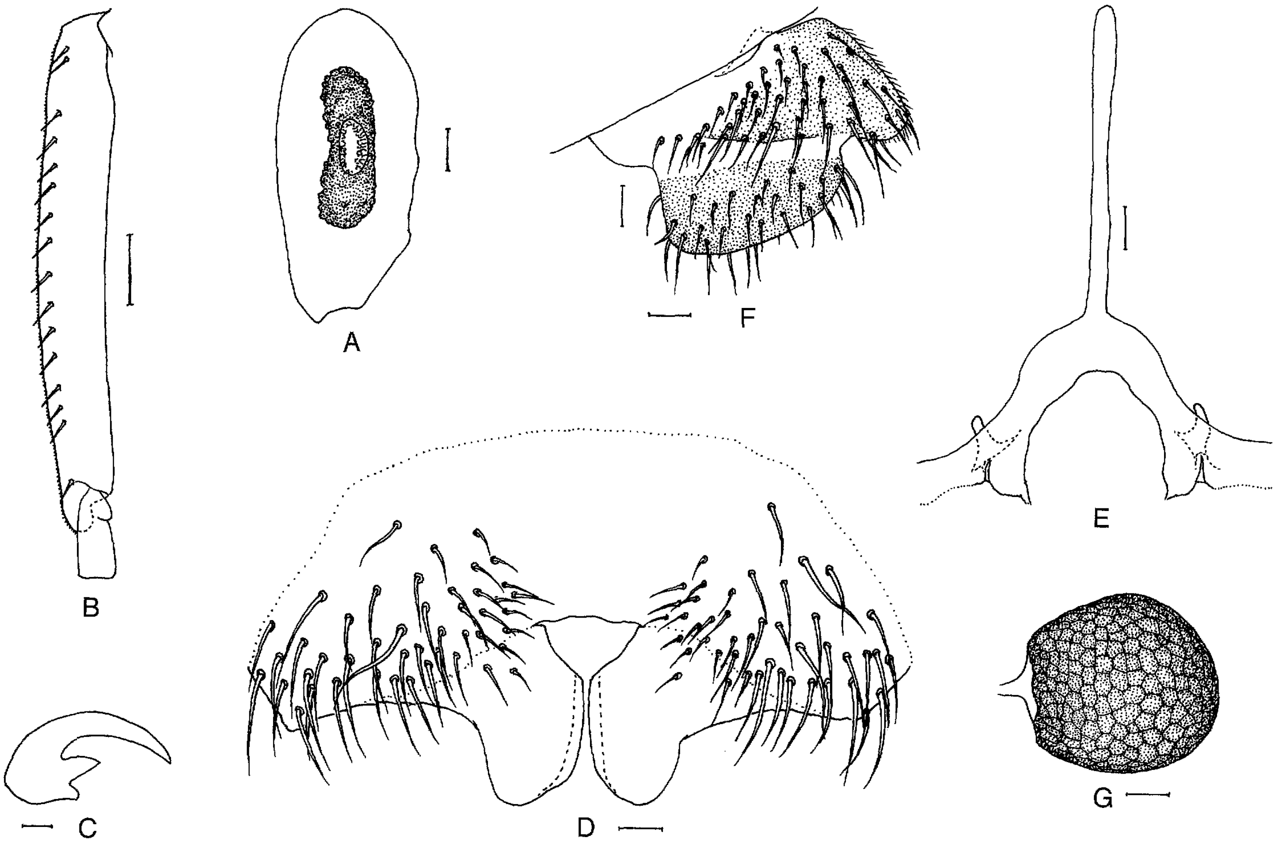

Fig. 1. Female of *Simulium* (*Montisimulium*) *angkaense*. A, 3rd maxillary palpal segment with sensory vesicle (right side and front view); B, hind tibia (left side; outer view); C, tarsal claw; D, 8th sternite and ovipositor valves *in situ* (ventral view); E, genital fork (ventral view); F, paraproct and cercus (right side and lateral view); G, spermatheca (lateral view). Scale bars. 0.1 mm for B; 0.02 mm for A and D–G; 0.01 mm for C.

anterodorsally on dorsal surface. Paraproct in lateral view (Fig. 1 F) moderately protruding ventrally, with 48 short to medium-long hairs on ventral and lateral surfaces, and with 9 sensilla on anteromedial surface. Cercus in lateral view (Fig. 1F) rounded posteriorly, about half as long as wide. Spermatheca (Fig. 1G) ovoidal, strongly sclerotized (except area around its juncture with duct unsclerotized), with distinct reticulate surface pattern, and with internal setae; accessory ducts subequal in diameter to each other and slightly larger in diameter than main duct.

Male. Body length 3.0 mm. ***Head***. Slightly wider than thorax. Holoptic. Upper eye consisting of large facets in 20 vertical columns and 22 horizontal rows. Clypeus dark brown, white pruinose, shiny when illuminated at certain angle of light, and moderately covered with dark simple long hairs. Antenna composed of scape, pedicel and 9 flagllomeres; blackish-brown except scape and pedicel dark yellow to light brown and basal 1/3 of 1st flagellomere whitish-yellow; 1st flagellomere elongate, 2.1 times as long as 2nd one. Maxillary palp composed of 5 segments, light to medium brown, proportional lengths of 3rd, 4th, and 5th segments 1.00 : 1.26 : 2.05; 3rd segment (Fig. 2A) of moderate size; sensory vesicle (Fig. 2A) ellipsoidal, 0.23 times as long as 3rd segment. ***Thorax***. Scutum brownish-black except anterolateral calli medium to dark brown, somewhat shiny at certain angle of light, and densely covered with yellow recumbent hairs mixed with several dark brown upright long hairs on prescutellar area. Scutellum dark brown, with many dark upright long hairs as well as yellow shorter hairs. Postnotum dark brown, somewhat shiny at certain angle of light, bare. Pleural membrane and katepisternum as in female. ***Legs***. Foreleg: coxa dark yellow; trochanter dark yellow to light brown with lower surface medium brown; femur dark yellow to light brown with apical

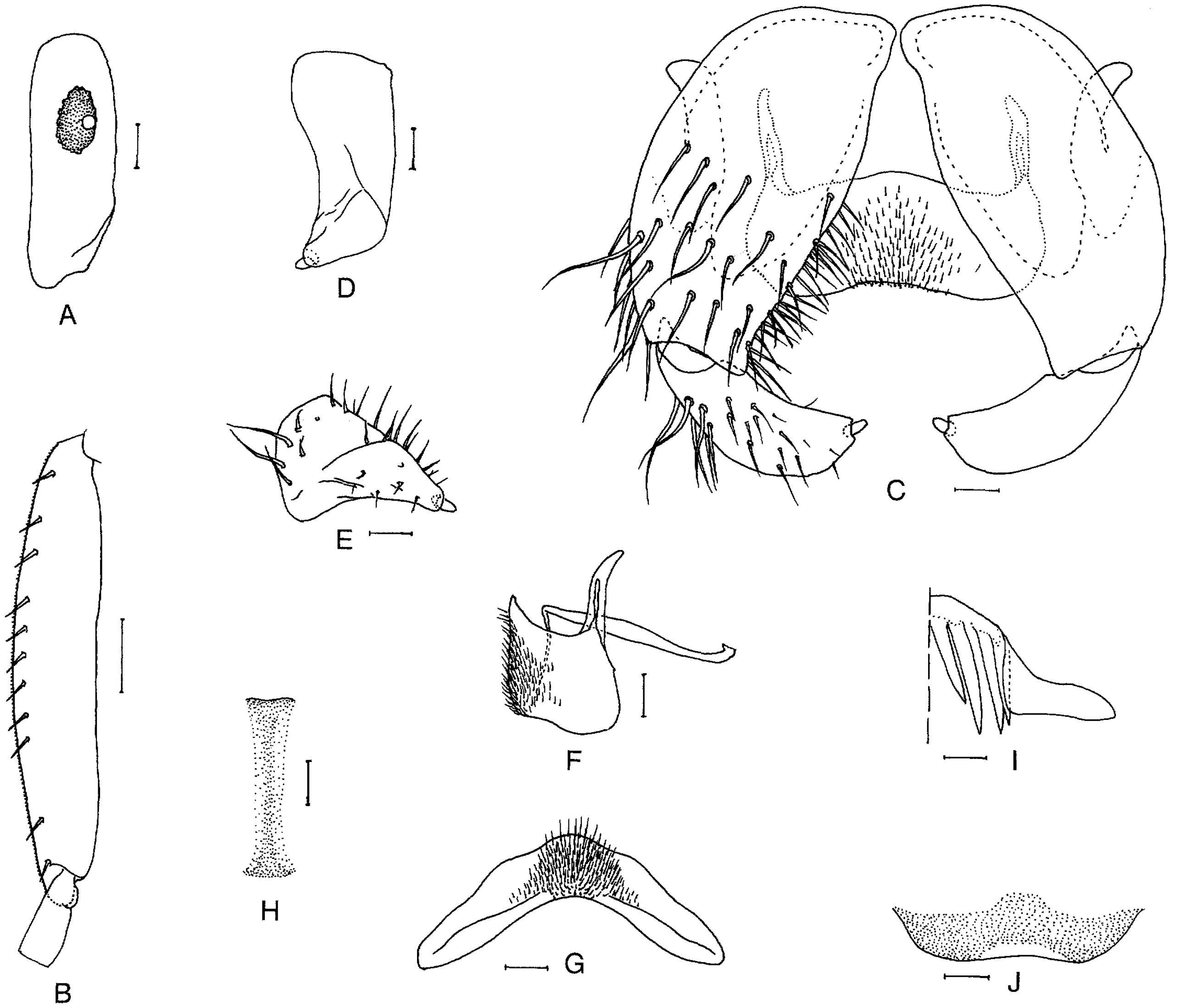

Fig. 2. Male of *Simulium* (*Montisimulium*) *angkaense*. A, 3rd maxillary palpal segment with sensory vesicle (right side and front view); B, hind basitarsus and 2nd tarsomere (left side and outer view); C, coxites, styles and ventral plate *in situ* (ventral view); D and E, style (right side; D, lateral view; E, end view); F, ventral plate and median sclerite *in situ* (lateral view); G, ventral plate (end view); H, median sclerite (anterior view); I, paramere (left side and end view); J, dorsal plate. Scale bars. 0.1 mm for B; 0.02 mm for A and C–J.

cap medium brown, though inner surface dark grayish-yellow; tibia brownish-black with median portion largely medium brown on outer surface; tarsus brownish-black; basitarsus very slightly dilated, 9.1–9.4 times as long as its greatest width. Midleg: coxa medium brown with posterior surface blackish-brown; trochanter dark yellow; femur dark yellow to ocherous with apical cap medium brown; tibia brownish-black with median portion largely medium brown on outer surface; tarsus blackish-brown. Hind leg: coxa medium brown; trochanter dark yellow; femur dark yellow to ocherous with apical cap dark brown; tibia blackish-brown except extreme base yellow; tarsus blackish-brown except basal 1/2 of 2nd tarsal segment yellow; basitarsus (Fig. 2 B) slightly swollen, spindle-shaped (though nearly parallel-sided medially), 5.4–5.9 times as long as its greatest width, 0.74–0.81 and 0.68–0.71 times as wide as greatest widths of tibia and femur, respectively; calcipala well developed, slightly shorter than its basal width, and 0.4 times as wide as greatest portion of basitarsus; pedisulcus well developed. ***Wing***. Length 2.4 mm. Other characters as in female except subcosta with 0–3 hairs. ***Abdomen***. Basal scale brownish-black, with fringe of dark long hairs. Dorsal surface of abdomen entirely brownish-black, and moderately covered with dark simple hairs; ventral surface ocherous to medium brown except sternites 3–8 dark brown. ***Genitalia***. Coxite in ventral view (Fig. 2C) subquadrate, much longer than wide. Style in ventral view (Fig. 2C) short, 0.6 times as long as coxite, broad, nearly parallel-sided, bent inward, tapered apically and with stout apical spine; style in lateral view (Fig. 2D) somewhat gently curved dorsally and with truncate apex with apical spine; style in end view (Fig. 2E) triangular, sharply tapered toward apex, and with 5 or 6 short setae as well as numerous microsetae on outer 1/2 or little more of posterodorsal surface. Ventral plate in ventral view (Fig. 2C) lamellate, much shorter than wide, well sclerotized, with posterior margin moderately concave, moderately covered with fine short setae medially on ventral surface, and its arms of moderate length, slender, directed forward or curved inwardly: ventral plate in lateral view (Fig. 2 F) nearly quadrate, with arm bent dorsally; ventral plate in end view (Fig. 2 G) deeply concave dorsally, moderately covered with fine short setae medially. Median sclerite (Fig. 2H) simple, narrow, club-shaped. Paramere (Fig. 2I) with 4 large hooks of unequal lengths. Aedeagal membrane with simple minute spines. Dorsal plate (Fig. 2J) broad, well sclerotized except posteromedial portion unsclerotized. Ventral surface of 10th segment with 3–6 hairs near each posterolateral corner. Cercus small, low in lateral view, encircled with 10–12 simple hairs.

SPECIMENS EXAMINED. 1 male reared from pupa and 2 females and 1 male reared from mature larvae, collected from a small forest stream of the Siribhume waterfall in Doi Inthanon National Park, Chiang Mai, Thailand, 11.III.2006, by W. Choochote.

REMARKS. The female and male of *S.* (*M.*) *angkaense* are described and illustrated for the first time. The female of this species is very similar to those of *S.* (*M.*) *merga* and *S.* (*M.*) *surachaii*, both of which are known from Thailand. However this species is distinguished from *S.* (*M.*) *merga* by the relative length of the tooth against the claw (0.32 in this species vs. 0.38 in *S.* (*M.*) *merga*) and the ratio of the widest/narrowest portions of arms of the genital fork (1.33 in this species vs. 2.25 in *S.* (*M.*) *merga*), and from *S.* (*M.*) *surachaii* by the relative length of the hind basitarsus against its width (7.3 in this species vs. 6.3 in *S.* (*M.*) *surachaii*), the relative length of the tooth against the claw (0.32 in this species vs. 0.28 in *S.* (*M.*) *surachaii*), and the medium brown area on each dorsolateral surface of the second abdominal segment which is absent in this species but present in *S.* (*M.*) *surachaii*.

The male of *S.* (*M.*) *angkaense* is very similar to that of *S.* (*M.*) *merga* and barely distinguished by the relative length of the hind basitarsus against its greatest width (5.4–5.9 in this species vs. 4.5 in *S.* (*M.*) *merga*) and the ratio of the greatest width of the hind basitarsus against that of the hind femur (0.68–0.71 in this species vs. 1.0 in *S.* (*M.*) *merga*).

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